Price-Capping regulation as a protectionist strategy in developing countries**

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Abstract: In developing countries undergoing liberalising economic reforms, there are typically local incumbents facing the loss of protection. Strategic lobbying by such firms for a price-capping regulatory regime is, under certain conditions, one way in which they can deter entry by competitors who are likely to be foreign firms. We show that a regulatory price can be set such that the net profit of the entrant is lower than the entry cost thus deterring entry. We then show that it is possible for the profit of the incumbent to be greater under regulation which deters entry than under unregulated duopoly. Counter-intuitively, we further discover that lobbying for regulation is to be expected where the incumbent firm is relatively cost-efficient. We also consider the case of multiple incumbents threatened by entry. We observe a co-ordination problem and consider the possibility of co-operation in lobbying. We then show that such co-operation, if possible, is always preferable to non-co-operation. We also extend our analysis to incorporate the possibility of lobbying by the entrant and show the importance of the cost of lobbying and the probability of successful lobbying by the incumbent.

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1 Introduction

Liberal economic reforms in developing countries have resulted in the removal by governments of various protectionist measures such as licensing, subsidies and other barriers to foreign direct investment (FDI), in order to encourage open competition either through imports or entry by foreign competitors. Domestic incumbents can engage in various strategies to cope with potential competitors among which are joint ventures or licensing agreements, often designed to acquire the advanced technology necessary to produce competitive goods. We are concerned with a less obvious strategy for deterring entry: lobbying of governments by the incumbent firm or firms for a price-capping regulatory regime.

We proceed by setting out the background and discussing previous work on the subject and especially recent modelling of situations under which firms might prefer regulation to deter entry. We then model the behaviour of two firms, an incumbent and an entrant, first in a situation of no regulation and then under price-capping regulation. We show in the first case that with no incumbent lobbying for a price-cap and with positive profits for the entrant, entry will occur. In the second case, we show that a regulatory price can be set such that the net profit of the entrant is lower than the entry cost thus deterring entry. We then show that it is possible for the profit of the incumbent to be greater under regulation which deters entry than under unregulated duopoly. Counter-intuitively, we further discover that lobbying for regulation is to be expected where the incumbent firm is relatively cost-efficient. We extend the model to consider the case of multiple incumbents threatened by entry. We observe a co-ordination problem in that firms may try to free ride other firms' lobbying costs. We consider the possibility of co-operation in lobbying by multiple incumbents and show that such co-operation, if possible, is always preferable to non-co-operation. We further extend the model to consider the case where the incumbent lobbies for regulation and the entrant lobbies for non-regulation. Here we find that the equilibrium strategy will crucially depend on the relationship between the cost of lobbying and the probability of successful lobbying by the incumbent.

This paper is organised as follows. Section 2 sets out the background and motivation of the paper, considering previous research on price regulation and noting the difference between the model presented here and other related models. Section 3 sets out the basic model with one incumbent and one entrant and presents the results. Section 4 extends the model to the case of multiple incumbents. Section 5 extends the model to the case where entrants can lobby. Section 6 concludes.

2 Background and Motivation

One of the principal arguments for trade liberalisation in developing countries is that competition from importing goods gives an incentive to domestic producers to reduce costs and thereby increase welfare. Such competition also gives domestic firms an incentive to engage in research and development in order to improve the quality of their products to competitive standards, once again increasing the general level of welfare. Rather than export goods to such markets, foreign firms might decide to set up production units in such countries and compete directly. Domestic firms under trade liberalisation are no longer able to keep such firms out because, typically, licensing systems which favour domestic firms no longer exist. Such incumbent firms need to find other strategies to maintain their position.

In at least the semi-industrialised developing economy case there are typically local incumbents, which are either monopolies or oligopolies, and in the transitional economies former state-owned monopolies. They will have enjoyed various kinds of protection – import controls, licensing, tariffs – but now face the certainty under liberalisation policies that competitive products will be sold on their previously protected markets. They also face the possibility that new, usually foreign, firms will enter, almost certainly with higher levels of technology and productivity. Local firms have several advantages over foreign firms. They have better knowledge of local institutions – government, finance, and the legal system. They have long experience of operating in local labour markets. Foreign firms face costs of acquisition of local knowledge and in dealing with government, as well as local capital and labour markets. However, they possess the more advanced technology. Local firms may meet such foreign competition

by co-operating in joint ventures or by buying the licences to import advanced technology from foreign firms.

Empirical studies bear out part of this story. Patibandla (2002) shows how in India the incumbent firms have increased their technical efficiency in order to compete successfully with the foreign entrants. They are less responsive in changing their organisational structures, but the efficiency losses from not doing this are outweighed by the greater knowledge they have of local institutions and markets. Entrants are still able to increase market share on the back of promotional expenditures, but they have relatively high entry costs in acquiring market information. However their market share can be limited by local competition from incumbents. This could deter market entry where set up costs are high and require large scale outputs, though new entrants are found to overcome this difficulty by exporting output which is surplus to domestic market requirements.

The implications for theory of this analysis are that foreign entry works to raise the technical level of incumbent firms, and, allowing for informational asymmetries, competition works in the way liberalisation theory suggests it should. Of course, it is easy to envisage a longer run case where foreign entry backed by superior technology, and established locally long enough to acquire knowledge of local markets and institutions, corners these markets and causes the demise of local firms, or takes them over. But local markets are not the only ones open to all the players. Increased access to export markets is considered to be a major benefit deriving from foreign participation in local manufacturing. Indeed it might be expected that foreign owned firms, or local affiliates of foreign owned firms, will operate at a higher level of technology thus allowing them to compete in export markets. However, Aggarwal (2002) finds that this is only true of low-tech sectors: in medium and high-tech sectors, local firms perform as well in export markets as do foreign affiliates. So competition does work to some extent, but not to the extent that high-tech entrants or incumbents who have converted to high-tech, emerge as the dominant force. One conclusion of Aggarwal's analysis is that high-tech foreign firms require a local infrastructure including a highly skilled labour force, to give them sufficient incentive to engage in advanced manufacturing. However this does not prevent new entry in lower-tech sectors.

Given that there are likely to be few such firms in even relatively industrialised developing and transitional economies – indeed in the latter they are likely to be privatised state monopoly enterprises - they are likely to want to maintain their monopolistic or oligopolistic position. The factors that currently deter foreign entry may not always exist. Such firms are likely to look for other ways to keep out foreign competition. One possibility is that they lobby for continued protection. The degree to which they are successful will depend on how far politicians respond to the lobbies. Brainard and Verdier (1994) have shown that where the gains to firms from lobbying are greater than those from adjustment, current protection is an increasing function of past protection. They have also shown that by making lobbies pay a fixed cost in order to be able to pay variable lobbying costs, it is possible that they adjust rather than seek continued protection Brainard and Verdier, 1997).

Other possibilities of incumbent firms' deterring entry emerges from recent literature on regulation. In a study of local telecommunications regulation in the US, Koski and Majumdar (2002) have shown that incumbent firms have responded to regulation by various strategies (such as increased advertising and where possible, increased access charges), that deter entry. Michaelis (1994) has pointed to the possibility of gains from regulation depending on firm's cost structures. He has further modelled the behaviour of firms with respect to political party contributions in strategic lobbying for regulation. Most recently, Iozzi (2001) has shown that under dynamic price cap regulation, the firm (in this case a monopolist) can successfully deter entry by committing itself to a sufficiently low price at the beginning, and therefore in the future, such that the fixed costs of entry are too high relatively to the prices which can be charged.

As Iozzi observes, the previous literature he reviews is concerned with the possibility that strategic pricing, in conditions where there is dynamic fixing of prices under regulatory regimes, has the objective of 'softening' the price constraint in the longer run. Iozzi departs from that literature by considering a firm under entry threat, and by showing that such a firm follows a strategy of 'tightening' the price regime over time in order to deter the threat of entry. The policy implication here is that the regulatory regime should prevent such a strategy in order to encourage entry.

Iozzi's analysis begs the question of why competition is necessary if the firm and the regulatory regime together produce a result that gives lower prices and therefore increased consumer welfare, though Iozzi does not consider welfare effects. One could go even further to ask why it is necessary to incur costs of regulation. The theory of contestable markets suggests that the existence of guaranteed free entry and the credible threat of entry together maintain a competitive price regime (Bailey, 1981; Baumol et al, 1982). Why worry about freedom of entry and the existence of competition if their welfare benefits can be obtained by other means? In the Iozzi case, a regulatory regime with long-term credibility will suffice to prevent backsliding. In the contestable markets case, the threat of entry has to be credible and persistent. One answer to the above question is that incumbents are able to sell at prices which effectively include the excess set up costs of the potential entrant resulting from information asymmetries and the like. Competition on a level playing field would eliminate these costs and cause market prices to fall to marginal cost. Keeping out competitors maintains profits at higher than competitive level.

The price-capping agreement in Iozzi's model is one case of the incumbent (a monopolist) using the regulatory regime to deter entry. In the semi-industrialised developing country case, with existing firms finding themselves in a previously protected and now liberalised market, a price-capping regime could have advantages in deterring the entry of foreign competitor firms. Here, we combine the issues of regulation and strategic lobbying to consider is the case of one or more firms lobbying government to introduce a regulatory price-capping regime, which both deters foreign entry and increases the level of domestic welfare. Under well-specified conditions, price-capping could have the paradoxical effect of protecting the position of incumbent firms against foreign investors and slowing some of the classic benefits of liberalisation.

At this point it is worth mentioning the difference between this paper and others mentioned here, especially Iozzi (2001) and Michaelis(1994). First, unlike Iozzi (2001), we endogenize the decision on regulation. Secondly, we extend the analysis to the case of multiple incumbents and show the possibility of a free-rider problem and the role of co-operation between the incumbents. Thirdly, we assume that in the post-entry game the

firms choose their outputs simultaneously while, Iozzi (2001) assumes that the firms choose prices in the output market and the incumbent firm acts as a price leader in the product market. Finally, we allow asymmetry between firms in their cost structure while Iozzi (2001) does not. A key difference between this paper and that of Michaelis (1994) is that our result holds even if the incumbent is cost-inefficient.

3 The model and results

Consider an economy with two firms, called incumbent and entrant. The incumbent firm is already in the market and has incurred the sunk cost of entry. However, the entrant has to decide whether to enter the market or not. In the case of entry, the entrant needs to incur a sunk cost, K.

We make the following assumption for the production technology of these firms. The incumbent and the entrant produce a homogenous product with constant marginal cost of production c_i and c_e respectively. We do not make any restriction on the superiority of the production technology of the incumbent and the entrant. Hence, we will conduct our analysis where $c_i >=< c_e$. For simplicity, we only assume that the marginal costs are such that both firms produce a positive output whenever they enter the market. As another simplification, we assume that there is no fixed cost of production. In section 4, we will examine the implications of fixed cost and entry cost on our results.

We assume that the inverse market demand function is given by

$$p = p(q_i + q_e), \qquad (1)$$

where p is the price of the product and q_i, q_e are the outputs of the incumbent and the entrant respectively. We assume that $p' < 0$ and $p'' \leq 0$. In the following analysis we use the subscripts i and e respectively.

We consider the following game. In stage 1, the incumbent decides whether to lobby for price-cap regulation. Then, in stage 2, the entrant decides whether to enter or not. In our analysis we normalize the outside option of the entrant to 0 and assume that

the entrant will enter provided it earns a net positive profit in this market. In stage 3, outputs would be chosen and the profits would be realized. We assume that in case of entry the firms simultaneously choose their outputs in the product market like Cournot duopolists. If entry does not occur then only the incumbent produces in the product market.

3.1 Market outcome under non-regulation

In this subsection, we assume that the incumbent firm does not lobby for price-cap regulation. Hence, if entry occurs, the profit of the incumbent and the entrant will be respectively

$$\pi_i^{nr}(c_i, c_e) = (p^*(q_i^* + q_e^*) - c_i)q_i^* \quad \text{and} \quad \pi_e^{nr}(c_i, c_e) = (p^*(q_i^* + q_e^*) - c_e)q_e^* - K, \quad (2)$$

where the superscript *nr* signifies non-regulated, the first (second) argument in the $\pi(.,.)$ stands for the marginal cost of production of the incumbent (entrant) and q_i^*, q_e^* are the optimal outputs of the incumbent and the entrant respectively.

If entry does not occur then the profit of the incumbent and the entrant are given by respectively

$$\pi_i^{nr}(c_i) = (p^m(q_i^m) - c_i)q_i^m \quad \text{and} \quad 0. \quad (3)$$

where superscript *m* signifies monopoly. If the entrant does not enter then the incumbent can produce the monopoly output in the market and earns the monopoly profit. Therefore, the entrant will enter this market whenever

$$\pi_e^{nr}(c_i, c_e) - K > 0. \quad (4)$$

In the following analysis we will assume that condition (4) holds. That is, the entrant will enter the market if the incumbent does not lobby for the price-cap regulation. Otherwise, the incumbent does not face a credible threat of entry because the entrant cannot make positive profits.

3.2 Market outcome under regulation

In this subsection, we will examine the profits of these firms when the incumbent lobbies for price-cap regulation. We assume that incumbent firm can lobby to the regulatory body for an upper bound on the industry price. The incumbent, however, needs to incur a cost L for lobbying. We may interpret this cost of lobbying as utility created by lobbying. For simplicity, we assume that this cost of lobbying is fixed and does not depend on the degree of price regulation.

It is trivial to note that whenever the incumbent lobbies for the regulation, it will ask the regulator to impose the upper bound on the industry price, say $\overline{p}$, that is lower than the industry price charged by the firms without lobbying. That is, the regulated price is lower than the profit-maximizing price of these firms under duopoly. Otherwise, lobbying has no impact on the market outcome. Further, it is clear that the incumbent will not lobby for any regulated price lower than c_i. Because, then, the incumbent will not be able to earn a positive profit. Therefore, the regulatory price should be between c_i and the profit-maximizing price under unregulated duopoly.

Since the regulated price is lower than the profit-maximizing price under duopoly, the industry output would correspond to the total demand at the regulated price. If entry occurs then the incumbent and the entrant will share the industry demand between them. The profit of these firms, however, will depend on the way they share the industry output. One reasonable procedure might be to consider that these firms would share the outputs according to their relative market share under unregulated duopoly and we will assume this sharing rule in our analysis, that is, $s_e = \frac{q_e^*}{q_e^* + q_i^*}$. This sharing rule is similar to the 'proportional reduction technology' defined in Schmalensee (1987). Our basic result will not be influenced by a different rule for market sharing under regulation. However, if the entrant does not enter then the incumbent will produce the total output corresponding to the regulated price.

Therefore, if entry occurs, then, under regulation, the entrant and the incumbent share the market as under unregulated duopoly but produce at a price, which is different from the profit-maximizing price under unregulated duopoly. This immediately implies

that the net profit of the entrant would be lower under regulation compared to non-regulation.[1]

The profit of the entrant under lobbying, constrained by the regulatory price, is given by

$$Max\{0, \pi_e^r(c_i, c_e) - K\}, \tag{5}$$

where $\pi_e^r(c_i, c_e) = (\bar{p}(\bar{q}) - c_e)s_e\bar{q} - K$. If the net profit of the entrant under the regulatory regime is lower than the entry cost then the entrant would not enter the market and would receive zero profit.

The effect of regulation on the production of the incumbent, however, depends on the entry decision of the entrant. The profit of the incumbent under regulation is given by

$$\pi_i^r(c_i, c_e) - L = (\bar{p}(\bar{q}) - c_i)s_i\bar{q} - L, \qquad \text{when} \quad \pi_e^r(c_i, c_e) - K > 0 \tag{6}$$

$$\text{or, } \pi_i^r(c_i) - L = (\bar{p}(\bar{q}) - c_i)\bar{q} - L \qquad \text{when} \quad \pi_e^r(c_i, c_e) - K < 0. \tag{7}$$

If entry occurs then the incumbent shares the industry output with the entrant and following the similar logic provided for the entrant, here the profit of the incumbent will be lower under regulation compared to non-regulation. But, if entry does not occur under regulation, then the incumbent would serve the total market. Hence, in this situation, the incumbent would act as a monopolist but constrained by the regulatory price. It is easy to check from (6) and (7) that for any regulated price, the profit of the incumbent is higher when the entrant does not enter compared to a situation when the entrant enters the market. Since the regulated price is lower than the price under non-regulation, it is

[1] From the first order condition for profit maximization, it could be argued that $(p^*(q_i^* + q_e^*) - c_e)q_e^* - K > (\bar{p}(q_i^* + \bar{q} - q_i^*) - c_e)(\bar{q} - q_i^*) - K > (\bar{p} - c_e)s_e\bar{q} - K$ where s_e is the entrant's market share under regulation and $\bar{q}$ is the industry output under regulated price $\bar{p}$.

intuitive to argue that the incumbent will not lobby for a price which is lower than the price that prevents entry.

Therefore if regulation does not prevent entry, then the incumbent earns a lower profit under regulation compared to non-regulation. Hence, the incumbent will have the incentive to lobby for regulation only if regulation prevents entry.

Lemma 1: *For any cost of lobbying, the incumbent will lobby for regulation only if regulation prevents entry. In this case, the price under regulation will be equal to the price that prevents entry.*

3.3 Decision on lobbying for regulation

In the last subsection we have seen that the incumbent has no incentive to lobby for regulation when regulation does not prevent entry. However, under regulation, the incumbent earns a higher profit under non-entry by the entrant compared to entry. In this subsection we will examine whether the profit of the incumbent under lobbying and non-entry by the entrant could be more compared to non-regulation.

From (2) and (7) we find that the incumbent's profit under regulation would be greater than that under non-regulation provided

$$(\bar{p} - c_i)\bar{q} - (p^*(q_i^* + q_e^*) - c_i)q_i^* > L. \qquad (8)$$

From condition (8), it is clear that the left hand side (LHS) of (8) is positive at $\bar{p} = p^*$ but negative at $\bar{p} = c_i$. The LHS of (8) is monotonically increasing in $\bar{p}$ over $[c_i, p^*]$. Hence, the LHS of (8) is positive if the regulated price is not sufficiently lower than p^*. Therefore, we find that the incumbent will never lobby for regulation if the regulated price, which is necessary to prevent entry, is sufficiently lower than the non-regulated price. Further, the critical regulated price that makes the incumbent indifferent between regulation and non-regulation increases with the costs of lobbying.

Like the incumbent, the gross profit of the entrant under regulation, i.e., $(\pi_e^r + K)$ also increases monotonically over $[c_i, p^*]$. Thus, we see that the amount of price reduction that is necessary to prevent entry reduces with higher entry cost. So, as the entry cost increases, it increases the net profit of the incumbent under regulation compared to non-regulation and makes lobbying for regulation more likely.

Next, consider the effects of marginal costs on the likelihood of lobbying. Define the LHS of (8) by X, i.e., $X = (\bar{p} - c_i)\bar{q} - (p^*(q_i^* + q_e^*) - c_i)q_i^*$, where $\bar{p} = c_e + \frac{K_q^*}{q_e^* \bar{q}}$. Differentiating X with respect to c_i, we find that $\frac{\partial X}{\partial c_i} >=< 0$ as

$$q_e^* \left((q_i^* - \bar{q}) + (c_e - c_i)\frac{\partial \bar{q}}{\partial c_i} \right) + K\frac{\partial q_i^*}{\partial c_i} >=< 0. \qquad (9)$$

If $c_e \geq c_i$ we find that the LHS of (9) is negative as $q_i^* < \bar{q}$, $\frac{\partial \bar{q}}{\partial c_i} > 0$ and $\frac{\partial q_i^*}{\partial c_i} < 0$. Therefore, we find that if the incumbent is not (marginal) cost efficient compared to the entrant then the benefit from lobbying increases as the incumbent becomes more cost efficient and hence, the incentive for lobbying increases.

If $c_i < c_e$ then $(c_e - c_i)\frac{\partial \bar{q}}{\partial c_i}$ is positive in (9) and the difference $(q_i^* - \bar{q})$ reduces with lower value of c_i. However, since the LHS of (9) is continuous in c_i and we have already seen that the LHS of negative at $c_i = c_e$, we can say that the incumbent's incentive for lobbying increases even when the incumbent is cost efficient compared to the entrant.

Let us now consider the effect of the marginal cost of production of the entrant. If the marginal cost of the entrant reduces then the profit of the incumbent under non-regulation reduces. The lower the marginal cost of the entrant, however, the more difficult it is relatively to prevent entry and hence the lower the regulated price needs to be. This will lower the profit of the incumbent under regulation. Since, we need to lower the regulated price further compared to the profit maximizing price under duopoly, it is

more likely that the lower the marginal cost of the entrant the less is the gain from regulation and hence, the lower the incentive for lobbying.

We find that $\frac{\partial X}{\partial c_e} >=< 0$ as

$$q_e^{*2}\left(\bar{q} + (c_e - c_i)\frac{\partial \bar{q}}{\partial c_e}\right) - q_i^*(K + q_e^{*2}\, p^{*\prime})\frac{\partial q_e^*}{\partial c_e} >=< 0\,. \qquad (10)$$

It is easy to check that the LHS of (10) is positive if the marginal cost of the entrant is sufficiently lower than the marginal cost of the incumbent, i.e., $c_i >> c_e$. This implies that, in this situation, the gain from lobbying reduces with the lower marginal cost of the entrant. Hence, here the incumbent has a lower incentive to lobby for regulation.

If the marginal cost of the incumbent is sufficiently lower than the marginal cost of the entrant, i.e., $c_i << c_e$, then we find that the LHS of (10) tends to $-q_i^*(K + q_e^{*2}\, p^{*\prime})\frac{\partial q_e^*}{\partial c_e}$. For these values of c_i and c_e, the values of both K, given by the positive profit condition for the entrant under non-regulation, and q_e^* are very small and the sign of the LHS depends on the sign of $(K + q_e^{*2}\, p^{*\prime})$. So, even in this situation, the incentive for regulation may be lower as the entrant becomes more cost efficient.

The following proposition summarizes the above discussions.

Proposition 1: *(a) The likelihood of lobbying for regulation increases with a higher entry cost and a lower cost of lobbying.*

(b) (i) If the marginal cost of the incumbent is not lower than the marginal cost of the entrant then the incentive for lobbying increases with the lower marginal cost of the incumbent.

(ii) If the marginal cost of the incumbent is lower than the marginal cost of the entrant, the incentive for lobbying may still increase with the lower marginal cost of the incumbent.

(c) The incentive for lobbying is likely to be reduced with a lower marginal cost of the entrant.

3.4 An example

In this subsection we provide an example for the conditions obtaining in Proposition 1. Let us consider that the inverse market demand function is linear and is given by $p = a - q$.

Under non-regulation the profit of the incumbent and the entrant are given by $\pi_i^{nr} = \frac{(a-2c_i+c_e)^2}{9}$ and $\pi_e^{nr} = \frac{(a-2c_e+c_i)^2}{9} - K$. The entrant's profit under non-regulation will be positive if $\frac{(a-2c_i+c_e)}{9}$ - $K > 0$.

Regulation will prevent entry when the price under regulation reduces to a price $\bar{p}$ satisfying the following condition:

$$\bar{p}^2 - \bar{p}(a+c_e) + \left(ac_e + \frac{k(q_i^* + q_e^*)}{q_e^*} \right) = 0 . \tag{11}$$

Since $\bar{p} \in (c, \frac{(2+c_i+c_e)}{3})$, we find that if $\bar{p} = \frac{(a+c_e) - \sqrt{(a+c_e)^2 - 4\left(ac_e + \frac{K(q_i^*+q_e^*)}{q_e^*} \right)}}{2}$ then the entrant does not enter into market under regulation. In this situation, the incumbent produces $\bar{q} = \frac{(a-c_e) + \sqrt{(a+c_e)^2 - 4\left(ac_e + \frac{K(q_i^*+q_e^*)}{q_e^*} \right)}}{2}$. We find that the net profit of the incumbent under regulation is given by

$$\pi_i^r = \frac{1}{4}\left[(a - 2c_i + c_e) - \sqrt{(a+c_e)^2 - 4\left(ac_e + \frac{k(2a-c_i-c_e)}{(a-2c_e+c_i)} \right)} \right]\left[(a - c_e) + \sqrt{(a+c_e)^2 - 4\left(ac_e + \frac{k(2a-c_i-c_e)}{(a-2c_e+c_i)} \right)} \right] - L. \tag{12}$$

The profit of the incumbent will be higher under regulation compared to non-regulation provided

$$\frac{1}{4}\left[(a-2c_i+c_e)-\sqrt{(a+c_e)^2-4\left(ac_e+\frac{K(2a-c_i-c_e)}{(a-2c_e+c_i)}\right)}\right]\left[(a-c_e)+\sqrt{(a+c_e)^2-4(ac_e+\frac{K(2a-c_i-c_e)}{(a-2c_e+c_i)})}\right]$$
$$-\frac{(a-2c_i+c_e)^2}{9} >=< L. \tag{13}$$

Suppose, $c_i = c_e = c$. Then we find that the incumbent will lobby for regulation provided $K \in \left(\frac{(a-c)^2+9L}{18}, \frac{(a-c)^2}{9}\right)$. The upper bound on the entry cost is given by the condition for net positive profit of the entrant under non-regulation. The interval $\left(\frac{(a-c)^2+9L}{18}, \frac{(a-c)^2}{9}\right)$ is non-empty provided $L < \frac{(a-c)^2}{9}$. Therefore, if $L < \frac{(a-c)^2}{9}$ and $K \in \left(\frac{(a-c)^2+9L}{18}, \frac{(a-c)^2}{9}\right)$ then the incumbent has the incentive to lobby for regulation when the incumbent and the entrant has same marginal cost of production.

In Figures 1 and 2 we show the effects of different marginal costs of production for the incumbent and entrant respectively. [2] In Figure 1 we consider a numerical example with $a = 1$, $c_e = .49$, $K = .00004$ and $L = 0$. Given these values of the parameters, we plot the LHS of (13) for $c_i \in [0, \frac{1.49}{2}]$ in Figure 1. This value of K ensures that the entrant earns a positive profit under non-regulation.

From Figure 1, it is clear that if c_i is less than a critical value then lobbying for regulation is the profitable strategy to the incumbent. In fact, we find in Figure 1 that the incumbent has the incentive to lobby for regulation only if the marginal cost of the incumbent is lower than the marginal cost of the entrant. Hence, it shows that we can expect lobbying for regulation in those industries where the incumbent firm is relatively cost efficient. This is a surprising finding given that it is usually inefficient firms which are expected to lobby for protection against competition.

[2] We use 'Mathematica 4' for Figures 1 and 2.

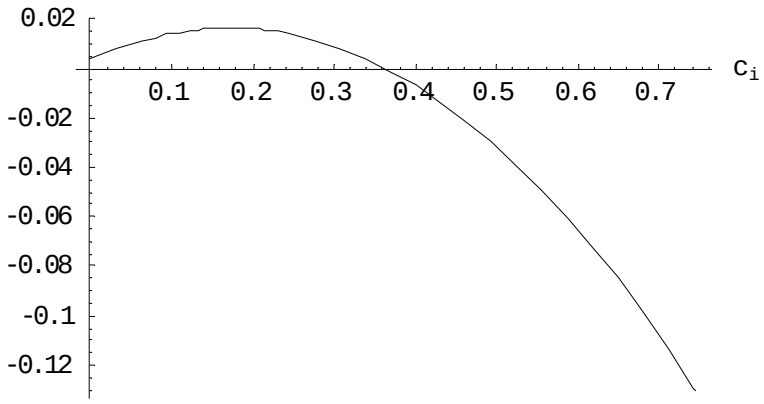

Figure 1: Left hand side of (13) for $a = 1$, $c_e = .49$, $c_i \in [0, \frac{1.49}{2}]$, $K = .00004$ and $L = 0$.

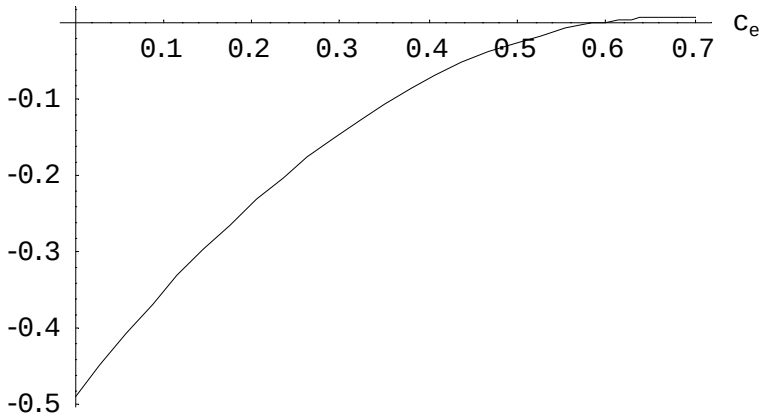

Figure 2: Left hand side of (13) for $a = 1$, $c_i = .49$, $c_e \in [0, \frac{1.4}{2}]$, $K = .0007$ and $L = 0$.

In Figure 2, we consider a different scenario to show the effects of different marginal costs of the entrant. We consider the following values for the parameters: $a = 1$, $c_i = .49$, $L = 0$, $K = .0007$. Given these values of the parameters, we plot the LHS of (13) for $c_e \in [0, \frac{1.4}{2}]$ in Figure 2. We find that the incumbent has the incentive to lobby for regulation provided the entrant is sufficiently cost inefficient. Therefore, one would expect lobbying for regulation in those industries where the entrants are relatively inefficient – again a surprising and counter-intuitive finding. This small value of K ensures that the entrant earns a positive profit under non-regulation.

4 Multiple incumbents

In the previous section, we have considered is the case of one incumbent in the market. The purpose of this section is to examine how the analysis would be affected when we have more than one incumbent in the market. In particular, in this section we will consider a situation with two symmetric incumbents and one entrant. We denote these incumbents by $i1$ and $i2$. Further, to make the threat of entry credible we assume that the entrant's net profit is positive when there is no regulation. Therefore, in case of non-regulation, the profits of the ith incumbent and the entrant are given by

$$\pi_{im}^{*}(c_i, c_i, c_e) \qquad \text{and} \qquad \pi_{e}^{*}(c_i, c_i, c_e) - K, \tag{14}$$

where, $m = 1,2$ and the first two arguments in the $\pi(.,.,.)$ function is for the marginal cost of the two incumbents and the third argument is for the marginal cost of the entrant.

4.1 Non-cooperative lobbying

In this subsection we consider that the incumbent decides on lobbying non-cooperatively. In the next subsection, we will consider the possibility of cooperative lobbying.

We consider the following game. In stage 1, the incumbents simultaneously decide whether to lobby for regulation or not. Then, in stage 2, the firms choose their outputs simultaneously, conditional on the decision of the first stage, and profits are realized.

If any of these incumbents wants to lobby for regulation, it requires that the firm incurs a disutility of L. In the previous section, we have shown that the incumbent will lobby for regulation only if regulation prevents entry. Following the similar argument, we can say that, in case of multiple incumbents also, neither incumbent will lobby for regulation if regulation does not prevent entry. Lobbying for regulation by any of these incumbents can reduce the price of the product to a level that prevents entry. Therefore, when the incumbents decide whether to lobby or not, their payoffs are given by the following payoff table.

		Incumbent 2	
		Lobbying	Not lobbying
Incumbent 1	Lobbying	$\pi_{i1}^{r}(c_i, c_i) - L$, $\pi_{i2}^{r}(c_i, c_i) - L$	$\pi_{i1}^{r}(c_i, c_i) - L$, $\pi_{i2}^{r}(c_i, c_i)$
	Not lobbying	$\pi_{i1}^{r}(c_i, c_i)$, $\pi_{i2}^{r}(c_i, c_i) - L$	$\pi_{i1}^{r}(c_i, c_i, c_e)$, $\pi_{i2}^{r}(c_i, c_i, c_e)$

Table1: Net payoffs of the incumbents

From Table 1, it is clear that (Lobbying, Lobbying) is never an equilibrium for any positive cost of lobbying. If an incumbent lobbies for regulation then the other incumbent does not have the incentive for lobbying since the incumbent who is doing lobbying can generate the desired outcome of regulation. (Lobbying, lobbying) could be the Nash equilibrium in case of zero cost of lobbying.

Further, it is easy to check that neither of these incumbents has the incentive for lobbying when the cost of lobbying is sufficiently high, i.e., when $L > \pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e)$, for $m = 1,2$.

If the cost of lobbying is not sufficiently high, i.e., $\pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e) > L$, we find that there are two pure strategy equilibria such as (Lobbying, Not lobbying) and (Not lobbying, Lobbying). In a purely non-cooperative set up this possibility can lead to a coordination problem between the incumbents. This coordination problem can generate a situation, which is similar to the mixed strategy equilibrium.

When $\pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e) > L$ then we have a symmetric mixed strategy equilibrium where each of thee incumbents lobby with a probability θ, where $\theta = \frac{(\pi_{im}^{r}(c_i, c_i) - \pi_{im}^{r}(c_i, c_i, c_e) - L)}{(\pi_{im}^{r}(c_i, c_i) - \pi_{im}^{r}(c_i, c_i, c_e))}$, where $m = 1,2$. We see that $\theta = 0$, when $L = \pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e)$ and for $L = 0$ we have $\theta = 1$. We consider that for these costs of lobbying, the incumbents play the symmetric mixed strategy equilibrium. Hence,

there is a positive probability that neither of the incumbents will lobby for the regulation and entry will not be prevented.

Since lobbying by any one of these incumbents can generate the desired result for the incumbents, each of these incumbents has the incentive for not lobbying when the other incumbent lobbies. This possibility may encourage each of the incumbents to free ride on the other incumbent. This free riding will benefit the free rider by saving the cost of lobbying but getting the benefit of lobbying. As a result, there is a positive probability that both firms will try to free ride and neither of them will lobby for regulation.

This fear of free riding by both firms may also encourage both firms to choose lobbying for regulation and hence, it may lead to a situation of over investment on lobbying. There is a positive probability that both incumbents will lobby for regulation.

The following proposition summarizes the above discussions.

Proposition 2: *(a) A free rider problem may arise when the costs of lobbying are not sufficiently high, i.e.,* $\pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e) > L$. *As a result, there is a positive probability that neither of the incumbents lobbies for regulation and entry is not deterred, even if lobbying is profitable to each of these firms compared to situation with no lobbying at all.*

(b) When $\pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e) > L$, *we may also observe over investment in lobbying.*

4.2 Cooperation in lobbying

In the above analysis we have seen that when there are multiple incumbents then there can be a coordination problem between the firms at the lobbying stage. This coordination problem may encourage the incumbents to cooperate in lobbying.

At this point it is worth mentioning that this type of cooperation in lobbying for regulation may be difficult to sustain since this type of agreement may not be accepted by the court of law, since such lobbying is aimed at preventing the entry of new firms. Agreements may therefore be non-enforceable and therefore open up the possibility of cheating.. This situation could be even worse if the disutility from lobbying is non-verifiable. However, cheating by a firm from any co-operative agreement may create a

significant fall in reputation among the other firms in the industry. This reputation effect may deter cheating and thus help these firms to sustain co-operation in lobbying. In the following analysis we will assume that the firms can make a credible agreement for lobbying.

We extend the game in the following way. In stage 1, these firms decide whether to go for co-operate in lobbying or not. If they do opt for cooperation then one of these firms will lobby and both firms will share the cost of lobbying equally. If they do not co-operate then, in stage 2, the incumbents decide on lobbying non-co-operatively. In stage 3, the outputs of the firms would be chosen and profits would be realized.

If, in stage 1, the incumbent decide that they will not cooperate in lobbying then the analysis will be similar to the subsection 3.1. If the incumbents, in stage 1, decide to cooperate in lobbying then the m th incumbent, $m = 1,2$, earns a net profit equal to

$$\pi_{im}^{r}(c_i, c_i) - \frac{L}{2}.^{3} \tag{15}$$

Now we are in a position to decide whether the incumbents would prefer co-operation in lobbying or not.

First, consider the situation where the costs of lobbying are sufficiently high so that neither of the incumbents lobbies for regulation, i.e., $L > \pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e)$. We see that here each of these incumbents prefers cooperative lobbying as long as we have

$$2(\pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e)) > L . \tag{16}$$

So, here cooperative lobbying agreements are preferable to non-co-operative lobbying. Reducing the cost of lobbying for each of the incumbents creates the incentive for such cooperation.

[3] We have already noted that whenever the incumbents lobby for regulation, they will ask for a regulated price that would prevent entry. This argument holds also if the incumbents cooperate for lobbying.

Next, we consider the situation, where the costs of lobbying are not sufficiently high, i.e., $\pi_{im}^{r}(c_i, c_i) - \pi_{im}^{nr}(c_i, c_i, c_e) > L$. Here, under non-co-operative lobbying, the incumbents will randomise between lobbying and not lobbying with a probability θ and $(1-\theta)$ respectively (see subsection 3.1). Therefore, for these costs of lobbying, each incumbent will prefer co-operation in lobbying compared to non-co-operation in lobbying provided

$$\pi_{im}^{r}(c_i, c_i) - \frac{L}{2} > \theta^2(\pi_{im}^{r}(c_i, c_i) - L) + \theta(1-\theta)(2\pi_{im}^{r}(c_i, c_i) - L) + (1-\theta)^2\pi_{im}^{nr}(c_i, c_i, c_e)$$

$$\text{or, } (1-\theta)^2(2\pi_{im}^{r}(c_i, c_i) - 2\pi_{im}^{nr}(c_i, c_i, c_e) - L) + \theta^2 L > 0. \qquad (17)$$

The condition (17) is always positive for these costs of lobbying. Hence, we have the following proposition.

Proposition 3: If co-operation in lobbying is possible then the incumbents will always prefer co-operation in lobbying compared to non-co-operation.

5 Lobbying by the Entrant

So far we have assumed that in the face of possible lobbying by the incumbent *for* regulation, the entrant does not lobby *against* regulation. This is not an unreasonable assumption if the entrant is a foreign firm and has little knowledge of domestic institutions and therefore for whom the cost of lobbying is possibly prohibitive. However, even in the case of a foreign firm, it is possible for this knowledge to be acquired, the cost of doing so being part of the fixed costs of lobbying. In lobbying against regulation, the entrant's objective is to get the market outcome under non-regulation. The questions are then first, under what conditions an entrant will lobby; and secondly, what is the best strategy for an incumbent to employ in the face of possible lobbying by the entrant.[4] For

[4] There is the further possibility that a foreign firm could lobby through a domestic partner. Such a possibility is implicit in our analysis.

simplicity we shall assume that the costs of lobbying are the same for both incumbent and entrant.

We consider the following game with a single incumbent and an entrant. In stage 1, both the incumbent and the entrant simultaneously decide to lobby. Then, in stage 2, the entrant decides whether to enter or not. In stage 3, outputs would be chosen and the profits would be realized. As before we solve the game through backward induction.

The firms will face the following payoff table when taking the decision in stage 1.

		Entrant	
		Lobbying	Not Lobbying
Incumbent	Lobbying	$p\,\pi_i^r(c_i) + (1-p)\pi_i^{nr}(c_i,c_e)$ -L, $(1-p)\,(\pi_e^{nr}(c_i,c_e)$ -K) -L	$\pi_i^r(c_i)$ -L, 0
	Not Lobbying	$\pi_i^{nr}(c_i,c_e)$, $\pi_e^{nr}(c_i,c_e)$ -K-L	$\pi_i^{nr}(c_i,c_e)$, $\pi_e^{nr}(c_i,c_e)$ -K

Table 2: Net payoffs of the incumbent and the entrant when both lobby.

When neither incumbent nor entrant lobby, then net profits are the same as the market outcome under non-regulation (see subsection 3.1). When only the incumbent lobbies, and lobbying is optimal[5], then the payoffs are the same as the market outcome under regulation (see subsection 3.2). When the incumbent is not lobbying and the entrant is lobbying, then the market outcome is similar to the former case except that the entrant incurs lobbying cost, *L*. Finally, if both lobby, then we assume that with probability, *p (1-p)*, the incumbent's (entrant's) lobbying will be successful and hence deter (cannot deter) entry.

From Table 2 it is clear that when the incumbent is not lobbying it is not optimal for the entrant to lobby. Given that the entrant is not lobbying it is always optimal for the incumbent to lobby since we assume that lobbying is optimal to the incumbent when the

entrant is not lobbying. Given that the incumbent is lobbying, the entrant has the incentive to lobby provided *(1-p)* ($\pi_e^{nr}(c_i, c_e)$*-K)* > *L*[6]. If p is close to 1 then the left hand of the inequality will tend to zero and hence the entrant has no incentive for lobbying. In general if p is greater than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$, then it is not optimal for the entrant to lobby, given that the incumbent is lobbying, and hence the equilibrium is (Lobbying, Not Lobbying).

If *p* is less than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$, then it is optimal for the entrant to lobby given that the incumbent is lobbying. Therefore, if the entrant lobbies then the incumbent will also lobby provided $p > \frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$.

We find that whether $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ is greater than equal to or less than $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ depends on the value of *L*. For example, when *L* tends to 0, $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ tends to 1 and $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ tends to 0. But, if *L* tends to $\left(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e)\right)$ then $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ tends to 1 which is greater than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$. Since, both $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ and $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ are continuous in *L*, we can say that if *L* is sufficiently low (high) then $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ is less (greater) than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$.

Let is first consider the situation where *L* is sufficiently low. If *L* is sufficiently low then $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ is less than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$. Therefore, if p is greater than $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ and less than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ then both firms will lobby in equilibrium.

If *p* is less than $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ then we find that it is optimal for the entrant to lobby when the incumbent lobbies. But, given that the entrant is lobbying, it is not optimal for the incumbent to lobby. However, we have already seen that if the incumbent does not lobby then it is optimal for the entrant not to lobby and when the entrant does not lobby then it is optimal for the incumbent to lobby. Thus, it is clear that if *L* and *p* are

[5] We assume that the conditions for optimal lobbying are as given in (8) in subsection 3.3.

sufficiently low then there is no pure strategy equilibrium, but there will be mixed strategy equilibrium of the lobbying game. Hence, in this situation, the incumbent and the entrant will optimally randomize between lobbying and not lobbying.

Next, consider the situation where L is sufficiently high so that $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ is greater than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$. As we have already mentioned the equilibrium will be (Lobbying, Not Lobbying) when the values of *p* is greater than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$. But, if p is less than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ then following the argument of the previous paragraph, we can say that in this situation the lobbying game will have a mixed strategy equilibrium where the incumbent and the entrant will optimally randomize between lobbying and not lobbying.

The following proposition summarizes the above discussion.

Proposition 4: *(a) Suppose L is sufficiently low so that* $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ *is less than* $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$.

(i) If p is greater than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ *then only the incumbent will lobby.*

(ii) If p is greater than $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ *and less than* $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ *then both firms will lobby.*

(iii) If p is less than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ *then both firms will optimally randomize between lobbying and not lobbying.*

(b) Suppose L is sufficiently high so that $\frac{L}{(\pi_i^r(c_i)-\pi_i^{nr}(c_i,c_e))}$ *is greater than* $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$.

(i) If p is greater than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ *then only the incumbent will lobby.*

(ii) If p is less than $\left(1-\frac{L}{\pi_e^{nr}(c_i,c_e)}\right)$ *then both firms will optimally randomize between lobbying and not lobbying.*

[6] We assume that the sum of entry and lobbying costs is less than the entrant's profit under non-regulation.

6 Conclusion

We have shown here that it is possible to conceive of a situation in which it is more profitable for incumbents to lobby governments to institute regulation by price-capping than it is in the absence of regulation. We have considered both situations where there is one incumbent and where there is more than one incumbent. In the first case it pays the incumbent to lobby for regulation as long as the regulated price deters entry. In the second case it also pays the incumbents to lobby as long as they all lobby individually (i.e. no-one free rides) or they co-operate in lobbying without any incentive to cheat. We have also considered the situation in which the entrant can lobby. Here we found that the decision to lobby will depend on the cost of doing so and on the probability of securing a successful outcome.

Of course we have assumed a political institutional framework in which governments accept to be lobbied. Firms may exert influence through politicians in constituencies where incumbents might be threatened by entry, through donations to political parties, or through appointments of influential ex-politicians to their boards of directors. Governments may be unwilling to risk the closure of incumbent firms because of the effects on employment and the regional/national economy. Price-capping regulation sought by incumbents constitutes a way in which the interests of incumbents can be protected without resort to protectionist policies. In allowing for the possibility of lobbying by entrants, we are also assuming that channels may exist for governments to be influenced by new players, and especially foreign investors.

The dilemma for policy makers is whether allowing price-capping protectionism is likely in the longer-run to lead to prices higher than they would be under open competition, as well as lead to a lower level of research and development by incumbent firms than would obtain under such competition. A further issue relates to different forms of entry. We have assumed here that entry is only possible through FDI. However, competition can also take place through trade, where the set up costs for foreign firms will be considerably lower than in the case of FDI. Future work will model dynamically R&D behaviour as well as price-capping behaviour in a competitive trade framework.

References

Aggarwal, A., 2002, 'Liberalisation, multinational enterprises and export performance: evidence from Indian manufacturing, *Journal of Development Studies*, **38**: 119 – 37.

Bailey, E. E., 1981, 'Contestability and the design of regularity and anti-trust policy' *American Economic Review*, **71**: 178 – 83.

Baumol, W. J., J. C. Panzar and R. D. Willig, 1982, *Contestable markets and the theory of industry structur*', Harcourt Brace Jovanovitch, New York.

Brainard, SL and T Verdier, 1994, Lobbying and adjustment in declining industries, *European Economic Review*, 38: 586-595.

Brainard, SL and T Verdier, 1997, The political economy of declining industries; Senescent industry collapse revisited, *Journal of International Economics*, 42: 221-237.

Iozzi, A., 2001, 'Strategic pricing and entry deterrence under price cap regulation', *Journal of Economics* (*Zeitschrift* f*ür Nationalökonomie)*, 74: 283 – 301.

Koski, H. A. and S. K. Majumdar, 2002, 'Paragons of virtue? Competitor entry and the strategies of incumbents in the U.S. local telecommunications industry', *Information Economics and Policy*, forthcoming.

Michaelis, P., 1994, 'Regulate us please! On strategic lobbying in Cournot-Nash oligopoly' *Journal of Institutional and Theoretical Economics*, 150: 693 – 709.

Patibandla, M., 2002, 'Policy reforms and evolution of market structure in an emerging economy: the case of India', *Journal of Development Studies*, **38**: 95 – 118.

Schmalensee, R., 1987, 'Competitive advantage and collusive optima', *International Journal of Industrial Organization*, **5**: 351 – 67.